15¢
$5.50 A YEAR

November 12, 1960

VOL. 78, NO. 20 PAGES 305-320

SCIENCE NEWS LETTER

RECEIVED
NOV 15 1960
MIAMI UNIVERSITY

THE WEEKLY SUMMARY OF CURRENT SCIENCE

MIAMI UNIV LIBRARY
PERIODICAL RECORD
OXFORD OHIO

king Up at −320° F

See Page 309

A SCIENCE SERVICE PUBLICATION

One of a series

Catching the Drift of Gyro Bearings

The fantastic accuracies needed by inertial guidance systems for space flight depend on the suppression of gyro drift, the tendency of a gyro to precess from minutely occurring internal torques. Particularly puzzling has been the problem of "jogs," or sudden axial shifts, within gyro spin-axis bearings. Shifts of but one ten-millionth of an inch can cause serious steering error.

Specialists at the GM Research Laboratories have found that the real key to drift lies in the thickness and distribution patterns of bearing lubricating films. Only a tenth of a milligram of oil — equivalent in volume to less than two-thousandths of a drop of water — is required in a gyro bearing, but even this amount unevenly distributed may cause jogs.

Conducting unique studies of single bearings apart from rotor assemblies, GM Researchers use a hydrostatic spindle and special instrumentation to take film-thickness measurements they compare with hydrodynamic theory. Jogs, due to excess oil supply, have been analyzed in relation to surface oil transfer and separator feed control, ball spin orientation, displacement, and differential heating and ball wander.

This experimental and analytical approach is achieving progress toward jog-free, stably distributed, and suitably thick oil films required in high-precision bearings. It is a further example of the critical and advanced research General Motors carries out in seeking "more and better things for more people."

General Motors Research Laboratories

Warren, Michigan

The fluoresced streaks show the disturbed "wake" of the lubricating film during bearing operation. The active part of the film, too thin to fluoresce visibly, averages ten-millionths of an inch in thickness.

GENETICS

Cancer-Resistant Chickens

Both male and female Leghorn chickens can transmit complete resistance to an infectious cancer of the bone marrow when bred from the same line, USDA scientists have found.

➤ CHICKENS resistant to an infectious, leukemia-like cancer of the bone marrow and blood have been developed by the U. S. Department of Agriculture.

This achievement indicates that animals can be bred for resistance to at least one form of cancer.

Geneticist Nelson F. Waters of USDA's Regional Poultry Research Laboratory at East Lansing, Mich., found that both male and female white Leghorns can transmit complete resistance to this particular type of cancer, known as erythroblastosis, to their offspring. Resistance was transmitted even though some of the mates were genetically susceptible to the disease.

The studies suggest that one pair of autosomal (not sex-linked) dominant, heredity-carrying genes may control resistance to erythroblastosis.

In one series of tests, Mr. Waters showed that of two blood brothers, one was capable of transmitting complete resistance to all his offspring, while the other transferred high susceptibility. Results were similar for other inbred lines of white Leghorns.

Mr. Waters also found that some females produced erythroblastosis-resistant progeny, even when mated to sires that produced susceptible chicks when mated to other hens.

Strangely enough, however, this resistance was transmitted only to birds of the same line. When resistant birds from two different lines were crossed, the resistance disappeared. In some cases, nearly 75% of the offspring died after inoculation with the erythroblastosis virus.

There is no satisfactory explanation as yet for this behavior, Mr. Waters reported in Agricultural Research, Nov., 1960. He is still trying to find out why resistance is inherited in certain lines but not in others.

Erythroblastosis is a form of the avian leukosis complex—a group of related cancerous diseases of poultry attacking different parts of the body. Natural occurrence of the disease is quite low, indicating the difficulty of transmission. Sometimes, however, the virus that causes erythroblastosis will also cause lymphomatosis, one of the most common and economically important forms of leukosis.

• Science News Letter, 78:307 November 12, 1960

GENERAL SCIENCE

Nobel Prize Winners

➤ A TRAIL OF BUBBLES that tells the tale of atomic particles is the idea for which Dr. Donald A. Glaser of the University of California, Berkeley, won the 1960 Nobel Prize in Physics.

Dr. Glaser conceived the idea that the bubbles in a liquid could be photographed to show the fleeting tracks of atomic particles. He perfected a radiation detector, the bubble chamber, based on this idea in 1954.

The bubble chamber made possible the mass production of simple photographs showing what happens in atomic collisions. Bubble chambers filled with various superheated liquids are placed in the beams of atomic "bullets" from virtually every atom-smashing machine in the world.

From the bubble chamber and other photographs of atomic collisions, scientists are learning more about the structure of the nucleus of the atom and how it is held together.

Until invention of the bubble chamber, scientists had only two ways of seeing and measuring the debris from atomic collisions. One was the cloud chamber, the other photographic emulsions. Dr. Glaser began work on the new approach in 1952 that ended in the bubble chamber.

"It occurred to me," he said, "that a superheated liquid, like a supersaturated vapor, might provide a medium that could be triggered by a small stimulus to yield a very large effect.

"Chemists already knew that a very pure liquid may be heated above its usual boiling point without boiling. A bit of broken glass thrown into such a liquid will cause it to erupt in violent boiling.

"I wondered whether a flying atomic particle might, under suitable conditions, trigger microscopic bubbles that start the boiling process. If so, they might make a visible track which could be recorded by means of high-speed photography. I made a simple test. The technique worked!"

The first accurate method for dating ancient objects brought a Nobel Prize in Chemistry to the inventor. Dr. Willard F. Libby, professor of chemistry at the University of California in Los Angeles, received the 1960 award for his use of radioactive carbon-14 to determine the age of plant and animal remains.

The red-headed scientist recognized that since radioactive atoms decompose at a constant rate they could be used as an atomic clock. In 1947 he demonstrated that cosmic rays were converting nitrogen in the upper atmosphere to carbon-14. Carbon dioxide in the atmosphere contains a very constant proportion of carbon-14.

Since plants use carbon dioxide to build their chemical constituents and in turn serve as food for animals, carbon-14 is present in all living animals and plants in a known quantity.

After the death of a plant or an animal, the amount of carbon-14 present decreases as the radioactive decomposition proceeds. One half of the radioactive carbon decomposes in approximately 5,600 years.

Dr. Libby is well-known also for his development of the use of tritium, the radioactive isotope of hydrogen, as a tracer for studying water in various meteorological and geophysical processes.

He was the first chemist to be selected as a member of the United States Atomic Energy Commission.

• Science News Letter, 78:307 November 12, 1960

DR. DONALD A. GLASER

DR. WILLARD F. LIBBY

PLANT FEEDING TUBES
3 for $1.00 p.p.

Feed water or liquid foods to your most precious plants (even when on vacation). Also save hours of drudgery if you have many plants to water daily. Feeding period adjustable over any desired time interval. Simplicity guaranteed. If you have ever re-corked a bottle, then no further experience is necessary to set up this plant feeder in 30 seconds. Rugged. No plastics. Will last for years. 10" long, ¾" diameter. Instruction free.
NOW, send $1.00 for 3 feeding tubes, p.p.
HARRY ROSS *Scientific & Lab Apparatus*
61-L Reade St., N.Y. 7, N.Y.

9-SCALE SLIDE RULE

WITH SELF-TEACHING MANUAL

$2.95 POSTPAID

Solve complicated multiplication and division problems in seconds! With a little practice calculate proportions, percentages, square and cube roots, reciprocals—even read logarithms. Easy-to-understand 16-page instruction manual explains how to operate in minutes. Ideal for students, teachers, scientists, draftsmen.

SPECIALLY SUITED FOR SLIDE RULE CLUBS
Rule is full 10" professional quality Mannheim with all 9 scales engraved on front face. Reverse side engraved with over 30 conversion settings for instantly changing inches to centimeters, knots to miles per hour, yards to meters, etc.
Made of rigid white plastic—rule will not swell, warp or stick; endures extreme heat, cold and humidity. All scales engraved. Rich cream-colored sheath. $2.95 ea.; Special classroom rates, 12 for $34.20. Specify model 400B.

OTHER MODELS AVAILABLE @ $1.95
Model 400 same high quality construction with plain reverse side. 12/$22.80
Folder available for other models.

Special! $8.95 20 SCALE LOG-LOG DECIMAL TRIG rule #1500. Best slide rule value.

THE JONATHAN COMPANY
P.O. Box 5095K, Mt. Carmel, Conn.

HERE'S A QUALITY STUDENT MICROSCOPE AT A BUDGET PRICE!

Although budget priced, the UNITRON Model MUS is definitely not just another student microscope. It includes these significant features often lacking in much more costly student models:

- NOT JUST a disk diaphragm . . . but an iris diaphragm for perfect control of aperture.
- NOT JUST a single focusing control . . . but both coarse and fine.
- NOT JUST a mirror . . . but a condenser for optimum illumination and resolution.
- NOT JUST one objective . . . but three: 5X, 10X, 40X.
- NOT JUST one eyepiece . . . but a choice of two from 5X, 10X, 15X.

Durable, sturdy — ideally suited to withstand the use and abuse of classroom and laboratory.

5—10 UNITS $66.60 F.O.B. Destination

ASK FOR A FREE 10 DAY TRIAL

Quantity discounts start at 2—only $65.12 for 11—24 units

UNITRON
INSTRUMENT COMPANY • MICROSCOPE SALES DIV.
66 NEEDHAM ST. • NEWTON HIGHLANDS 61, MASS.

Please rush UNITRON's Microscope Catalog. S-1-2
Name
Company
Address
City State

PSYCHIATRY

Open Doors Both Ways

➤ THE "OPEN DOOR" policy for mental hospitals, which has become widespread in recent years, needs improvement, Dr. Robert H. Felix, director of the National Institute of Mental Health and president of the American Psychiatric Association, told the Twelth Mental Hospital Institute in Salt Lake City.

"For the open door to become effective, it must be a swinging door," he said.

The open door policy, he explained, is a policy of making it possible for patients to move more freely from the hospital into the world beyond. But, he added:

"I do not believe the doors can stay open unless they become doors that open both ways, unless they are doors that let the community into the hospital as well as letting the patients go out into the communiy."

In recent years, many mental hospitals have held exhibits of patient art.

"But so far as I know, no hospital in this country has brought the paintings of established artists to the patients in the hospital itself," Dr. Felix said.

"What is more natural than that the patient should want to be surrounded by works of art or at least have the opportunity to see well-planned exhibits of creditable work?

"Patients, like other people, want to exercise their intellectual abilities. How many mental hospitals in this country have developed cooperative programs with departments of education, colleges and universities to bring stimulating adult education programs into the hospital?"

Dr. Felix said that mental illness, except for some organic conditions, "does not rob a person of his intellect or reduce his mental activities to the level of a child. Unfortunately, the regime in too many mental hospitals does just that."

The paths leading into the mental hospital should be made smoother for the mental patient, Dr. Felix said. The public should know that the hospital exists and what services it offers to the patient who needs help wih emotional problems. And the roads out of the hospital when the patient is ready to reassume his place in the family, in industry and in the community should be opened up and made easier to travel.

• Science News Letter, 78:308 November 12, 1960

IMMUNOLOGY

Polio Shot Effective In Four-Way Vaccine

➤ SALK POLIO VACCINE has been found to be more effective when given with diphtheria, tetanus and whooping cough vaccines in combined injection than when given alone.

This is reported in the Journal of the American Medical Association, Oct. 29, 1960, along with these findings from research:

Frozen foods handled according to good commercial practice are safe and nutritious but thorough cooking of precooked food is advised.

Serotonin, a compound found in the blood, can cause migraine headaches, and anti-serotonin therapy can reduce the frequency and severity of attacks when taken as a preventive agent by some persons.

Of the two anticoagulants, heparin and Dicumarol, heparin permitted more adequate anticoagulant therapy in an overcrowded and understaffed hospital.

• Science News Letter, 78:308 November 12, 1960

SCIENCE NEWS LETTER
VOL. 78 NOVEMBER 12, 1960 NO. 20

Edited by WATSON DAVIS

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington 6, D. C., NOrth 7-2255. Cable Address: SCIENSERVC.

Subscription rates: 1 yr., $5.50; 2 yrs., $10.00; 3 yrs., $14.50; ten or more copies in one package to one address, 7½ cents per copy per week; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage.

Change of address: Three weeks notice is required. When ordering a change please state exactly how magazine is now addressed. Your new address should include postal zone number if you have one.

Copyright © 1960 by Science Service, Inc. Republication of any portion of SCIENCE NEWS LETTER is strictly prohibited. Newspapers, magazines and other publications are invited to avail themselves of the numerous syndicated services issued by Science Service. Science Service also publishes CHEMISTRY (eight times a year) and THINGS of Science (monthly).

Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 13, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Reader's Guide to Periodical Literature, Abridged Guide, and the Engineering Index. Member Audit Bureau of Circulation.

SCIENCE SERVICE

The Institution for the Popularization of Science organized 1921 as a non-profit corporation.

Board of Trustees—Nominated by the American Association for the Advancement of Science: William W. Rubey, U. S. Geological Survey; Wallace R. Brode; Douglas Whitaker, Rockefeller Institute for Medical Research. Nominated by the National Academy of Sciences: Harlow Shapley, Harvard College Observatory; Philip Bard, Johns Hopkins University; Henry Allen Moe, John Simon Guggenheim Memorial Foundation. Nominated by the National Research Council: Leonard Carmichael, Smithsonian Institution; John R. Dunning, Columbia University; Benjamin H. Willier, Johns Hopkins University. Nominated by the Journalistic Profession: Michael J. Ogden, Providence Journal-Bulletin; O. W. Riegel, Washington and Lee University; Lee Hills, Detroit Free Press. Nominated by the Scripps Estate: Edward J. Meeman, Memphis Press-Scimitar; Frank Ford, Washington, D. C.; Charles E. Scripps, Cincinnati, Ohio.

Officers—President: Leonard Carmichael; Vice President and Chairman of Executive Committee: Charles E. Scripps; Treasurer: Wallace R. Brode; Secretary: Watson Davis.

Staff—Director: Watson Davis. Writers: Gloria Ball, Ann Ewing, Lillian Levy, Faye Marley, Jane Marye, Tove Neville, Marjorie Van de Water, Judy Viorst. Science Youth Division: Joseph H. Kraus, Shirley Moore, Dorothy Shriver, Leslie Watkins. Photography: Fremont Davis. Production: Priscilla Howe, Marcia Nelson. Syndicate Sales: Hallie Jenkins. Librarian: Margit Friedrich. Interlingua Division in New York: Alexander Gode, 80 E. 11th St., GRamercy 3-5410. Advertising Manager: Fred A. Moulton, MEtropolitan 8-2562.

MEDICINE

Make Valley Fever Vaccine

➤ IMMUNIZATION against valley fever is possible—for mice at least and soon may be for man, two University of California scientists from Berkeley have reported.

Valley fever, known technically as coccidioidomycosis, is a lung disease caused by an airborne fungus prevalent in arid regions of California and the southwestern United States. The immunization method was achieved through development of a "spherule-endospore vaccine."

This experimental vaccine can cut deaths from more than 50% in non-vaccinated mice to less than five percent.

The vaccine's effectiveness was demonstrated on animals infected by fungal spores entering the lungs via the nasal passages, which is the same way that man contracts the disease.

Problems remain to be solved, however, before tests can be made on man, Dr. Hillel B. Levine, associate bacteriologist, reported to the American Public Health Association in San Francisco. He described research conducted at the University's Naval Biological Laboratory with Dr. C. E. Smith.

Hope for an effective vaccine arose from Dr. Smith's work several years ago showing that even the mildest case of valley fever leaves the patient with a lifelong immunity to the disease.

Other studies showed that in highly endemic areas, such as near Bakersfield, Phoenix and El Paso, the disease infects almost 95% of the residents. Nearly two-thirds of these have no sickness with valley fever at all; the remainder are more serious, but in only a few cases is the disease fatal.

The work of Drs. Levine and Smith is based upon the known fact that the fungus *Coccidioides immitis* undergoes a startling change when it leaves the soil and infects man or animals.

Instead of focusing on the whiskery fungus found in the soil, as others had done in attempts to develop a vaccine, the California scientists worked out improved methods for growing and purifying large amounts of the fungus spherules and endospores—forms that are found in the infected body. They killed these particles, put them in a vaccine and began the immunization tests on mice.

First they infected the vaccinated animals by the nasal route with up to 500 valley fever spore particles. Less than five percent died. Next they infected non-vaccinated mice with only 20 or 30 spore particles. Some 50% died.

Eventually, they found that it took about 1,000 particles—far more than the number infecting man under natural conditions—to kill 50% of the vaccinated mice.

• Science News Letter, 78:309 November 12, 1960

MEDICINE

Many Early Miscarriages

➤ THE CHANCE for miscarriage is much greater in the early weeks of pregnancy than some previous reports have shown, two scientists from the University of California, Berkeley, have found.

Their five-year study, conducted on the island of Kauai, Hawaii, is the first attempt to follow all pregnancies in a community over a period of years.

The report shows a rate among early-reported pregnancies of 221 fetal deaths, commonly called miscarriages, per 1,000 total births, much higher than earlier studies based on medical records have indicated.

The risk of prenatal loss is probably highest in the first week of pregnancy, then declines gradually until the time of birth, their study showed.

These findings were reported to the American Public Health Association meeting at San Francisco by Dr. Fern E. French, biostatistician, and Dr. Jessie M. Bierman, professor of maternal and child health, of the University of California's School of Public Health, Berkeley.

One of the aims of the study was to identify every pregnant woman on the island of Kauai within a month after her first missed menstrual period.

Some 85% of all the fetal losses occurred from the fourth through the 15th week of pregnancy, the report said.

Contrary to earlier findings based on medical records alone, the Kauai study showed that fetal losses from the fourth to the seventh week of pregnancy were as high or higher than losses in the eighth to the 15th week.

The findings can be applied in the United States mainland, the Berkeley scientists said, because Hawaii has a very high health status and compares favorably with the other states in life expectancy at birth, proportion of women receiving prenatal care, and number of infants born in hospitals.

• Science News Letter, 78:309 November 12, 1960

PHYSICS

New Laboratory Tool Analyzes Low Pressures

➤ A NEW LABORATORY TOOL for measuring pressures less than one-thousandth of one-billionth of atmospheric pressure at the earth's surface has been developed by scientists at the Westinghouse research laboratories, Pittsburgh.

The device, known as a photomultiplier ion gauge, was developed as part of an ultra-high vacuum research program for the U. S. Atomic Energy Commission's Project Sherwood. It uses a beam of ultraviolet light to release electrons that form ions, collected and counted in the usual manner.

Conventionally, the electrons come from the surface of a hot tungsten filament located inside the vacuum system and in contact with the gas whose pressure is being measured.

• Science News Letter, 78:309 November 12, 1960

TECHNOLOGY

Vessels for Liquid Gases Tested to Breaking Point

See Front Cover

➤ PRESSURE VESSELS, made from a nine percent nickel steel for storage and transportation of liquefied gases, have been tested to the breaking point.

One application of the nickel steel vessels may be in the storage and distribution of liquid oxygen and nitrogen. Large users of liquid oxygen are steel mills, chemical plants and missile launching sites.

One of the vessels, seen on the cover of this week's SCIENCE NEWS LETTER, was pressurized until it broke by first being filled with liquid nitrogen and then subjected at minus 320 degrees Fahrenheit to severe shock by a 4,340-pound ball.

The testing program was conducted by the International Nickel Co., Inc., Chicago Bridge and Iron Company and United States Steel Corporation at Fairless Hills, Pa.

• Science News Letter, 78:309 November 12, 1960

USING ULTRAVIOLET BEAM

DENTISTRY

Gumifrices Tested

➤ STUDIES on Pennsylvania prisoners who volunteered to chew bubble gum indicate that diseased gums may provide a route for dangerous infection to enter the blood stream.

Periodontal (gum) disease is known to cause the loss of more adult teeth than all other factors, including tooth decay.

For the experiment, Dr. Morris V. Shelanski, director of the Industrial Biology Resarch and Testing Laboratories, Philadelphia, and Dr. William Shoulberg, a Philadelphia periodontist, selected 50 volunteer convicts with gum disease mild enough that none had sought dental advice. After each of two gum-chewing sessions that resulted in gum bleeding, 11 of the 50 had bacteria in their blood streams.

The investigators then tested the ability of two products, called "gumifrices," just as tooth pastes are dentifrices, to toughen the gums to the point where they no longer bled and formed open wounds through which bacteria could enter the body.

The 11 subjects were divided into three groups; one group was instructed to rub their gums every two hours with a gumifrice, Gum-Kare, designed to improve resistance to gum bleeding. A second group used the same procedure with a similar preparation, Bio Gum-Kare, containing a mild anesthetic and the antibiotic, neomycin. The three remaining subjects brushed their teeth regularly with tooth paste.

After two weeks of this treatment, all the gum-rubbing subjects had no bacteria in their blood samples, while those who brushed their teeth with regular tooth paste tested positive for bacteria.

"Although this study was performed on a small number of subjects," the doctors concluded, the gumifrices, when compared to tooth paste, "were effective in reducing the presence of bacteria in the systemic blood stream by treating the source of infection, namely, by treating the infected gums."

The gumifrices used in the Pennsylvania study have no competitors on the market at present. The manufacturer, Crane-Hall Corporation, said that the antibiotic gumifrice, sold only under prescription, has shown promise in combating cases of trench-mouth. The products are not claimed to be cure-alls, but may be effective as home-care aids for periodontal disease.

This infection starts when the gums become inflamed, swell, and form open pockets between tooth and gum. The pockets are deepened, sometimes to a fifth of an inch, by bacterial toxins that eat away the fine filaments connecting the tooth to supporting gum and bone. Eventually the tooth foundation is weakened and the tooth itself is lost.

About 84% of the U. S. population has periodontal disease. Because the condition usually is chronic rather than acute, many persons are not aware of its presence. But they are often brought to painful realization when the dentist, in an effort to save the teeth, must cut away the portion of the gums that serves only as a disease pocket.

• Science News Letter, 78:310 November 12, 1960

MEDICINE

Arsenic Linked to Cancer

➤ ARSENIC in both coal smoke and cigarette smoke as a cause of lung cancer gets new emphasis from Dr. Henry S. Satterlee of Newport, N. H., in the New England Journal of Medicine, Vol. 263:676, 1960.

Going back to the arsenic-poisoning epidemic of 1900 that affected 6,000 beer drinkers in the Manchester-Salford-Liverpool district of England, Dr. Satterlee applies a background feature of the investigation by the Royal Commission on Arsenical Poisoning to the flue-curing of tobacco today.

A time-honored British practice, he says, was drying the malted barley in the fumes of arsenic-containing malting fuels to impart a smoky flavor to English ales.

This cause of arsenic poisoning was further proved in 1902 when another epidemic of arsenic-beer poisoning in Halifax, Nova Scotia, was shown to be the result of using gasworks coke as a malting fuel high in arsenic content.

Dr. Satterlee traces conflicting reports that alternately place arsenic high and low among recognized causes of cancer.

He says there has been a tendency to remove arsenic from serious consideration as a cancer-causing influence in city environments because it appears to be a negligible component of air pollution.

Dr. Satterlee blames faulty methods of sampling for this attitude, and says special investigation is needed. Pointing out that the arsenic concentration in expired air is nearly three times the tolerance limit, he conjectures on the arsenic content of the confined atmosphere in crowded vehicles, movie theaters and crowded sleeping quarters of low-class dwellings.

Dr. Richard A. Prindle, deputy chief of the U. S. Public Health Service Division of Air Pollution, Washington, D. C., minimizes the danger of arsenic in the air, in response to an inquiry.

"We regularly take samplings from the air of 31 cities across the country in a search for arsenic and other contaminating elements," Dr. Prindle said. "This is a small part of the 200 stations for sampling that we maintain because so little arsenic is found.

"Out of 520 analyses in 1954," he said, "275 did not have detectable quantities of arsenic in the air."

Dr. Prindle admitted the possibility of lung cancer being caused by the arsenic in tobacco sprays, but says without Federal regulatory authority the spraying laws are up to the states.

• Science News Letter, 78:310 November 12, 1960

MILITARY SCIENCE

Infantry to Get Better Sniperscopes

➤ A "SNIPERSCOPE" infrared gunsight will soon help the infantryman see farther in the dark. A new model to go into production soon has a target image twice as big as those used in World War II.

The battery supply for the unit will weigh 13 pounds; the older models weigh 28. The unit, developed by the Raytheon Company at its Santa Barbara, Calif., operations, is designed for the M-1 carbine.

• Science News Letter, 78:310 November 12, 1960

READY FOR A MOON STROLL

ASTRONAUTICS

Moon Suit for Astronauts Functions as House Too

➤ A TWO-PIECE moon suit that can be used by astronauts to scout around, dig or do other chores, and will serve as a house as well, has been developed by Republic Aviation Corporation, Farmingdale, N. Y.

The suit, exhibited in the Science and Industry Exposition on Long Island, could be used when astronauts have to get outside the space vehicle that brought them to the moon. When the operator of the suit wants to rest, he can withdraw his legs from the lower trouser-like sections and rest and sleep within the suit.

• Science News Letter, 78:310 November 12, 1960

ASTRONAUTICS

Of Men and Mice in Space

Radiation hazards in space include vision damage and muscle feebleness. Mice have flown almost 700 miles into space. Food problems for man are great out there, Lillian Levy reports.

▶ VISION DAMAGE, even blindness, as well as radiation sickness, muscle feebleness and general weakness, may be some of the effects of extended confinement in a space environment on man.

These dangers of interplanetary manned space flights were outlined by Dr. Hubertus Strughold, professor of space medicine at the School of Aviation Medicine, Brooks Air Force Base, San Antonio, Tex.

"As long as the sun appears as a disc, or as far out as Saturn, there is the risk of retinal burns if the astronaut looks into the sun," Dr. Strughold reported at a symposium on the Medical and Biological Aspects of Energies of Space at Brooks Air Force Base. (Saturn is nine times farther from the sun than the earth.) Such damage can be incurred by sungazing on earth, he said, but there is greater danger as man speeds through space.

Solar energy needs within a space cabin probably will require an orbit or position exposing the cabin interior to the sun's light. Under such conditions of solar exposure, Dr. Strughold said, vision damage will result unless the space traveler wears automatically functioning light-absorbing glasses.

As man travels farther into space, to Pluto (40 times farther from the sun than earth) and beyond, the danger of eye damage from sunlight decreases. But the absence of sunlight in extended space flight would affect crops grown on board, seriously cutting down oxygen supply.

Photosynthesis, by which sunlight and carbon dioxide are changed into food, water and oxygen, would not be possible. Long term manned space exploration requires a functioning photosynthetic system, Dr. Strughold said.

Light production by a nuclear power plant could, however, be used to support the life-sustaining process of photosynthesis. The artificially produced light would make the space cabin independent of the sun, but the nuclear reactor would increase the danger of radiation exposure within the cabin.

Just traveling through space, without a nuclear power system, exposes ship and occupants to extremely high levels of radiation. An accumulation of more than 50 roentgens over a period of months could lead to radiation sickness and seriously decrease efficiency of a space crew, Dr. Strughold said.

Weightlessness, the absence of gravity in space, is expected to "lead to muscle feebleness and general weakness," Dr. Strughold said. This could be counteracted with gymnastics performed "with special space gymnastic equipment." Such equipment might include muscle vibrators.

• Science News Letter, 78:311 November 12, 1960

Mice Pave Way for Men

▶ THE FUTURE in space looks very good—at least, for mice.

Sally, Amy and Moe, the Air Force moustronauts, have flown almost 700 miles into space at a speed of 17,000 miles an hour and lived to squeak about it at home base. "Home" for the mousy space pioneers is the Space Research Institute at the School of Aviation Medicine, Brooks Air Force Base, Texas.

Radiation data recorded in the high-flying mice were reported to SCIENCE SERVICE in an exclusive interview with Dr. Hans Clamman, the Space Institute's chief of space medicine. The animals' exposure to the dangerous radiation in the lower Van Allen belt, one of the known hazards of space flight for man and animals, has been evaluated.

MOUSTRONAUT WIRED FOR SPACE

"It is below ten roentgens for sure," Dr. Clamman said. Four hundred roentgens is the exposure dose fatal to 50% of men and animals.

The mice were in the area of intense cosmic radiation for two minutes only. Space scientists have suggested that the danger of exposure to high levels of radiation in the Van Allen belts could be reduced by swift passage through them. The three mice have now proved that this is so.

The radiation story was recorded on miniature instruments, tiny specially prepared glass rod "dosimeters," each one-quarter of an inch long and one-tenth of an inch in diameter, and sensitive to radiation from one roentgen to 10,000 roentgens.

None of the mice has so far shown any of the graying effects on their black fur that would indicate severe radiation exposure. All physical responses, heart beat, respiration, appetite, blood pressure, appear normal. They behave just like any other normal, healthy, frisky mice.

• Science News Letter, 78:311 November 12, 1960

Space Ship Farms

▶ CROP FAILURES may be expected in interplanetary farming in the confines of a space ship just as on earth, but farm failure in space is irrevocable, Dr. Daniel I. Arnon, professor of cell physiology at the University of California, Berkeley, reported.

Dr. Arnon spoke at a symposium on the Medical and Biological Aspects of Energies of Space at the School of Aviation Medicine, Brooks Air Force Base, San Antonio, Tex.

Although Dr. Arnon stressed the possibility of crop failure of algae used in photosynthesis, he said that this did not indicate that he was pessimistic about the ultimate success and value of such farming to the man in space.

"I merely want to emphasize," he said, "that at the present stage of our knowledge, we cannot afford to take chances on complete dependence on such a system in space."

A photosynthetic system, theoretically, could supply man in space with the main essentials of life: food, water and oxygen.

Dr. Arnon pointed out that a crop failure would mean the death of the system and possibly the death of the astronauts that might be dependent upon it.

"Until inherent biological uncertainties are removed, man must take reserve supplies of his life needs with him in space," Dr. Arnon said. Dr. Arnon, and his associates at Berkeley, Drs. Mitsuhiro Nozaki and Manuel Losada, are trying to "unravel the mechanics of photosynthesis, to break the process down to its component parts to eliminate present biological uncertainties." Their research, still a long distance from the goal, he said, has revealed important evidence on the process of evolution of primitive plant and bacterial life as it existed hundreds of millions of years ago on earth, and the advances to more complicated plant and bacteria structure and behavior.

• Science News Letter, 78:311 November 12, 1960

AERONAUTICS

Method Devised to End Telltale Vapor Trails

▶ A DEVICE has been developed that prevents high-altitude jet aircraft from leaving smoke-like trails that friendly and enemy observers can follow easily.

Air Research and Development Command engineers developed the method for reducing the size of water vapor particles so they are no longer visible from the ground. In the method, the size of the water droplets forming the trail are reduced by mixing dust-like particles in the engine exhaust.

The smaller droplets cannot be seen from the ground. The method has been proved effective in tests at L. G. Hanscom Field in Bedford, Mass., Air Force reported.

• Science News Letter, 78:311 November 12, 1960

MEDICINE

Progress in Missiles Has Advanced Medicine

➤ MISSILE DISCOVERIES have proved "good medicine," Surgeon General O. K. Niess of the U. S. Air Force told a meeting of Association of Military Surgeons of the United States in Washington, D. C.

Gen. Niess said that a derivative of hydrazine, developed as a liquid missile propellant, had been found useful in treating tuberculosis and mental illness.

"Another missile discovery has been modified to produce a means of rapidly lowering blood pressure to make operations safer," he said. Civilian heart specialists believe a small missile valve may be used to replace a defective valve in the human heart.

Electronic equipment for missiles and for space currently is being adapted to measure body temperature and blood flow.

Besides these important medical contributions made through missile development, Gen. Niess credited aerospace medical research with "a great impact on general medicine" by its pioneering in such areas as the cause and effect of stress, fatigue and tension.

Space medicine is influencing the development of medical instrumentation and methods used in diagnosis, observation and therapy, he said, by speeding the improvement and miniaturization of many appliances used in diagnostic procedures.

• Science News Letter, 78:312 November 12, 1960

PUBLIC HEALTH

Influenza Vaccination Urged for Aged and Ill

➤ PROTECTION from influenza for the aged and chronically ill through immediate vaccination is urged by the Public Health Service Advisory Committee on Influenza Research.

Although the National Office of Vital Statistics has not yet reported an influenza outbreak this year, Asian flu accounted for some 86,000 excess deaths in three epidemic waves in 1957-1958 and again in the early months of 1960. Almost 60,000 excess deaths were recorded in the six-month period from October to March, 1957-1958. The 1960 epidemic caused an excess of over 26,000 deaths.

Routine immunization is recommended for all persons 65 years of age or older, for pregnant women, for patients of all ages who suffer from heart, lung, kidney or metabolic disorders.

The U. S. Public Health Service says that although influenza may not be more likely to attack persons in these groups than others, it is more likely to threaten their lives. Bacterial complications are more frequent in patients with cardiovascular, kidney and pulmonary diseases, and influenza alone puts severe stress on heart and lung functions.

The adult dosage recommended by PHS of the commercial influenza vaccine, which is a killed virus preparation made up of different strains, is one cubic centimeter injected under the skin on two occasions two or three months apart.

Since the typical flu "season" begins in November, extending through February or March, the Public Health Service advises early vaccination. Each fall prior to Nov. 1, booster shots should be given.

There is only one word of warning on the allergy reactions to be expected. The vaccine is produced in eggs, so the Advisory Committee has advised against vaccination for persons unable to eat eggs or chicken because of food allergy, or for those who have had a definite allergic reaction on previous inoculation of an egg vaccine.

• Science News Letter, 78:312 November 12, 1960

MEDICINE

Drugs Combined to Treat High Blood Pressure

➤ THE FIRST large-scale controlled test of newer antihypertensive drugs in general use has been announced by the Veterans Administration after nearly two years of research in eight VA hospitals. Dr. Edward D. Freis of the Washington, D.C. VA hospital, was chairman of the study which involved some 320 patients with high blood pressure.

Patients with severe and moderately severe cases were given combinations of the tranquilizer reserpine with each of three nerve-blocking drugs—mecamylamine, chlorisondamine and pentolinium tartrate. All three were about equally effective in producing significant reductions in blood pressure.

But undesirable reactions varied slightly, producting slightly more dryness of mouth and bladder difficulty with mecamylamine than the other two drugs. Chlorisondamine treatment caused some visual disturbance.

Patients with mild and moderately severe high blood pressure were given a reserpine-hydralazine combination, which was more effective than reserpine alone.

• Science News Letter, 78:312 November 12, 1960

NUTRITION

Taste of Fish Affected by Water

➤ YOU HAVE HEARD of fishy water, but the water from which fish are taken may influence the flavor of the fish.

Taste tests conducted by the University of Wisconsin food nutrition specialists, Ruth Baldwin, Dorothy H. Strong and J. H. Torrie repeatedly compared the flavor and aroma of baked fish caught in different locations. Results showed that the tasters frequently gave poorer flavor and aroma scores to fish taken in streams below the entry of effluent from industrial plants such as paper mills. But fish caught in a shallow, muddy lake were rated about the same as those taken from a deep, cold lake.

The researchers emphasized that the tests did not yet prove that the effluent from the factories actually caused the poorer flavor, as other conditions could have existed that affected the flavor and aroma.

It was also found in the tests that weight, length or the sex of fish did not seem to affect either flavor or aroma.

• Science News Letter, 78:312 November 12, 1960

IN SCIEN

MEDICINE

Suggests Standard Terms For Artificial Parts

➤ DISCUSSIONS of artificial kidneys, hearts, and lungs have become so confusing some scientists see the need for a standard naming system for man-made body parts.

The problem, says Dr. Willem A. van Bergeijk of the Bell Telephone Laboratories, Murray Hill, N. J., is that scientific reports invariably compare the artificial device with the real organ. In such cases, the reader gets lost and cannot tell whether the writer is referring to the device or the "prototype."

To dispel the literary fog, Dr. Bergeijk suggests in Science, 132:1248, 1960, using the suffix-mime, in conjunction with the root word for the organ represented. Thus an artificial kidney would be a nephromime. The system could also be used to name mathematical models of organs and functions.

• Science News Letter, 78:312 November 12, 1960

PALEONTOLOGY

New Findings Support Evolutionary Theory

➤ THE IDEA that there were two paths of evolution, one of which led to mammals and man, has received new support.

Dr. Nicholas Hotton, paleontologist of the Smithsonian Institution in Washington, D. C., reported that the two evolutionary lines are distinguishable from differences in changes in the structure of the jaw. These changes in turn affected the structure of the middle ear.

Both evolutionary lines made experiments to establish themselves on dry land and adapt to this kind of existence, Dr. Hotton's studies show. In many cases the smaller cold-blooded animals, presumably the most active, were most successful in achieving this.

• Science News Letter, 78:312 November 12, 1960

OCEANOGRAPHY

Silver-Plated Cable Used for Ocean Probe

➤ A FIVE-MILE LENGTH of silver-plated cable will enable naval oceanographers for the first time to study ocean depths for long periods of time. The cable, produced by Electrical Cable Works of U. S. Steel's American Steel and Wire Division, Worcester, Mass., was silver-plated for greater conductivity.

The cable will connect a remote-controlled underwater device with a U. S. Marine Corps "Ontos" tank, an electro-mechanical arm that simulates the motions of a human arm. The undersea vehicle will be used for observations of the sea floor, collection of samples and installation of deep-bottom instruments.

• Science News Letter, 78:312 November 12, 1960

E FIELDS

MEDICINE

Allergies Discovered To New Penicillin

➤ TWO PATIENTS have shown extreme sensitivity to the new "synthetic" penicillin called phenethicillin.

Because allergy to penicillin makes its use difficult, if not impossible, in some patients, the new product raised hope that it could be used safely in patients who previously had shown allergic reactions to penicillin.

Both patients who reacted unfavorably to the new penicillin were women, Drs. Leo H. Criep, University of Pittsburgh School of Medicine, and Herman Friedman, Temple University School of Medicine, Philadelphia, reported in the New England Journal of Medicine, 263:891, 1960.

• Science News Letter, 78:313 November 12, 1960

ASTRONOMY

New Variable Star Discovered in Orion

➤ A NEW VARIABLE star has been discovered in the constellation of Orion by the Chilean astronomer de la Vega, after whom the star is named.

The new variable, so-called because its brightness varies over a period of time, is of fifth magnitude and can be seen with the naked eye as a faint object to the right of Orion's belt.

The constellation Orion is visible low in in the east late in the evening sky. Right ascension of the new variable when discovered was four hours, 59.5 minutes; declination, plus zero degrees, 35 minutes.

Discovery of the new star, de la Vega, on Oct. 25 was reported to astronomers in the Western Hemisphere by Harvard College Observatory.

• Science News Letter, 78:313 November 12, 1960

ZOOLOGY

How Hermit Crab Selects Home Explained

➤ HOW THE HERMIT CRAB—the intertidal creature that takes over unoccupied shells—selects its home has been explained by Dr. Ernest S. Reese, a University of Hawaii zoologist.

Dr. Reese said the crab's taste in dwellings is inborn and its choice is determined by a meticulous and seldom varied "house-hunting routine."

The routine is as follows: When the crab is old enough for a home of his own, his vision can distinguish an object that contrasts with its background coloration. The object must have a rough exterior so the crab can grasp and maneuver it.

Weight now enters the picture. Since the crab must carry its dwelling about, it tends to select an object that has a certain ratio to its weight. As the crab grows, it will periodically select larger objects to maintain this ratio.

By now the crab, through his tactile and kinesthetic (muscle) sense, will have determined that the object is a shell of a particular species. His innate discriminatory capacity in this respect leads it to favor a particular species of shell.

Having discovered the shell's aperture by then, the crab will insert his abdomen. If this is a proper fit, the crab has found a home.

In principle the househunting routine of a hermit crab may not be far different than that of a careful housewife. The main difference is that the crab's taste is a matter of genes and not of culture, Dr. Reese explained. Dr. Reese was formerly on the staff of the University of California at Los Angeles.

• Science News Letter, 78:313 November 12, 1960

CHEMISTRY

Find 4,000 Degrees Is Technetium Melting Point

➤ ONE MORE CONSTANT of nature has been determined. The melting point of technetium, element 43, the first element made in the laboratory by man, has been found for the first time. It is within 50 degreees of 2,200 degrees centigrade (about 4,000 degrees Fahrenheit).

The determination was made on a fraction of an ounce of the element loaned to British scientists at the University of Oxford by the U. S. Atomic Energy Commission laboratory at Oak Ridge, Tenn. It was made by Drs. E. Anderson, R. A. Buckley, A. Hellawell and W. Hume-Rothery, who report results of their investigation in Nature, 188:48, 1960.

Technetium does not occur naturally on earth. It has been found in stars, including the sun, and is produced artificially as a radioactive substance by atomic bombardment of molybdenum or as a fission product in nuclear reactors.

• Science News Letter, 78:313 November 12, 1960

MEDICINE

Cancerous Fluids Treated by Yttrium

➤ A COMPOUND, colloidal radioactive yttrium silicate, has advantages over radioactive gold in the treatment of malignant fluids in lung and abdominal cavities.

Six patients treated with the yttrium chemical got relief for five to 19 months, Prof. J. Walter of the University of Sheffield, England, reported in the British Medical Journal, Oct. 29, 1960.

He said that if experience confirms the safety of the new compound, it could replace radioactive gold in body cavity treatment. Prof. Walter reported that the new compound is less of a radiation hazard for personnel than radioactive gold.

The advantages of yttrium over gold, he says, include superior surface penetration of the beta particles as well as less radiation hazard owing to absence of penetrating gamma radiation.

• Science News Letter, 78:313 November 12, 1960

MEDICINE

Drug Controls Blood Fats In Diabetic Patients

➤ TABLETS containing heparin have been successful in controlling blood fats for some diabetics, Dr. John K. Finley, Hahnemann Medical College, Philadelphia, reported at the Southern Medical Association meeting in St. Louis, Mo.

Dr. Finley, a specialist in eye disorders, said the damage to tiny blood vessels of the eye, which makes diabetes the second-ranking cause of blindness in the United States, appears to be due to an excess of fats, rather than sugar, in the blood. It has long been believed, Dr. Finley said, that the insulin which keeps blood sugar under control will also control blood fats.

In four of five patients treated with heparin for 18 months, improvement was seen in the eye lesions, but Dr. Finley's study is preliminary. He said three to five years of additional treatment may be required to "clarify the results of correction of the fat transport disorder."

• Science News Letter, 78:313 November 12, 1960

MEDICINE

Antibiotic From Japan Fights Deadly Infection

➤ A JAPANESE-DEVELOPED antibiotic called Colistin is as effective as but less toxic than Polymyxin B against the deadly pseudomonas infections, scientists of the University of Washington, Seattle, have reported.

Pseudomonas is a species of bacteria outstripping staphylococcus in frequency as a cause of fatal infection in hospital patients.

Drs. C. Evans Roberts Jr., Henry A. Kuharic and William M. M. Kirby said studies in the United States over the past two years had shown Colistin (sodium colistinmethanesulfonate) to be active against a number of gram-negative bacterial disease-producing organisms.

They reported to the Conference on Anti-Microbial Agents in Washington, D. C., results of treatment of 20 adults and children with severe pseudomonas infections, in most cases unresponsive to other antibiotics.

Injections with Colistin resulted in complete eradication of the pseudomonas infection in 11 of the 20, while an additional four showed definite improvement. In two of the patients the results could not be determined, and in only three did the infections fail to respond.

From two to six milligrams of Colistin could be given as opposed to a maximum dosage of 2.5 milligrams of Polymyxin B.

Urinary infections were present in all 20 patients, but in addition to kidney disease, illnesses included acute bacterial endocarditis (inflammatory heart disease), acute inflammation of the lungs, meningitis and bacteremia (bacteria in the blood).

The investigators concluded that Colistin is a relatively safe and effective antibiotic in treating pseudomonas infections. The Society for Industrial Microbiology is sponsoring the conference.

• Science News Letter, 78:313 November 12, 1960

GENERAL SCIENCE

Science for Christmas

Christmas gifts for science-minded young ones, based on information supplied by young scientists, parents and teachers, are collected in a convenient guide by Shirley Moore.

➤ THIS CHRISTMAS you may be giving a favorite child or young person a fascinating interest for the rest of his life or even the beginning of a future career in science. So you may welcome some ideas for Christmas science based on information compiled by SCIENCE SERVICE from the experience of particularly promising young scientists and their parents and teachers.

Some of the items on this Christmas shopping list are brand new this year. Others suggest materials you may not have thought of as possible Christmas gifts or have had no idea where to find.

Jigsaw puzzles, tinker toys, construction sets, beginners' chemistry sets and simple microscopes are especially important from two or three years of age until about 12 in developing children's interest and activity in science, the parents of the top winners in the 19th Science Talent Search reported to SCIENCE SERVICE.

Enthusiasm for science had been catalyzed before seventh grade for 63% of the finalists at the 11th National Science Fair-International this year, in another Science Service survey of students participating in its activities. There was specific interest in rocks, plants, stars, insects and similar fields beginning as early as the pre-school years for many of these young people.

The selections made for the following shopping guide are based on these studies and other information supplied by young scientists. Suggested items are listed as samples of the wealth of excellent materials available this year.

NATURE GAMES, card games using colorful, authentic pictures, common and scientific names. Nautilus (shells), Goldfinch (birds), Monarch (moths and butterflies), Chipmunk (animals), Goldenrod (wildflowers), Juniper (trees), Cinnabar (rocks and minerals). $1.35 per game, five for $6, from Nature Games, 8339 W. Dry Creek Rd., Healdsburg, Calif. (6-12 yrs.)

FLASH CARDS, for learning and games. Know Your Stars and Planets, Know Your Addition and Subtraction, etc. Rand McNally & Co. $1 in stores. (6-10 yrs.)

BEGINNER'S CHEMISTRY SET, instructions for experiments such as food testing, invisible ink, magic tricks. Gilbert. $3 in stores. (8-12 yrs.)

S-SHAPED TEST TUBE RACK, bent, one-piece, anodized aluminum unit, holds eight test tubes, resists corrosives, may be used in ovens or autoclaves. $1.80 per holder from Fisher Scientific Co., 414 Fisher Bldg., 717 Forbes St., Pittsburgh 19, Pa. (from 12 yrs.)

PYREX LAB KIT, beakers, test tubes, thistle tube, condenser, retort, flasks, etc., Skil Craft Corp. $10 in stores. (from 12 yrs.).

CELESTIAL JIGSAW PUZZLE map of stars. Stars shown in white, constellations and mythological figures in green. $1.95 from Science Materials Center, 59 Fourth Ave., New York 3, N.Y. (6-12 yrs.)

SPACE MAP AND MOON MAP, on reverse sides of large full-color wall poster showing craters, mountains, oceans and valleys of moon; map of planets, drawings of rockets and satellites, space facts. Rand McNally & Co., 29¢ in stores. (All ages.)

THINGS of science, experimental kits such as kaleidoscope, flexagons, butterflies, sextant, optical illusion, etc. 75¢ each; year's subscription for monthly units, $5; a special collection of 15 assorted kits, $7.97. SCIENCE SERVICE, 1719 N St., N.W., Washington 6, D. C. (From 10 yrs.)

CAMERON HERBARIUM, 26 bristol board mounting cards with plant outlines, 11" x 8½", punched for binding, nomenclature and classification, marble board portfolio. $1.44 plus postage from Carolina Biological Supply Co., Elon College, N. C. (From 12 yrs.)

PLANT PRESS, softwood frame, 12 absorbent blotter driers, 12 ventilators, woven cotton straps. $4.50 plus postage for 4 lbs. 12 oz. from Carolina Biological Supply Co., Elon College, N. C. (From 12 yrs.)

BOOKS, one of the most permanently valuable gifts for a young scientist. For a guide to the hundreds of excellent, accurate and appealing ones for children, see THE SCIENCE BOOK LIST FOR CHILDREN by Hilary J. Deason, $1 from American Assn. for the Advancement of Science, 1515 Massachusetts Ave., N.W., Washington 5, D. C. Also, there are some not available in stores, such as the MONTHLY SCIENCE PROGRAM, booklet in new field of science each month, color photos for mounting, other special material. $1 a month for as long as desired from Science Program, Dept. 9-NR-0, Garden City, N.Y. (All ages.)

EDISON AND OTHER EXPERIMENTS YOU CAN DO, basic material taken from laboratory notebooks of famous scientists. 25¢ from SCIENCE SERVICE, 1719 N St., N.W., Washington 6, D. C. (8-15 yrs.)

PICTORIAL ENCYCLOPEDIA OF SCIENTIFIC KNOWLEDGE, one-volume coverage of large number of topics in compact text, clear illustrations. Published in England, available here from C. S. Hammond & Co., Maplewood, N. J., for $8.95. Possibly in stores also. (All ages.)

PAPERBACK EDITIONS, a good way to give a basic library inexpensively, issued by nearly all major publishers and university presses, available in book stores, magazine stands, or by mail. To mention only a few examples, THE ABC OF RELATIVITY, Bertrand Russell, 50¢ from New American Library of World Literature, Inc.,

CHRISTMAS SCIENCE SURPRISE—This Christmas stocking is bulging with gifts especially chosen to delight a young scientist for many years.

501 Madison Ave., New York 22, N. Y. From same source, UNDER THE SEA WIND, Rachel Carson, 35¢; THE NATURE OF THE UNIVERSE, Fred Hoyle, 50¢. (From 15 yrs.)

CONCERNING THE NATURE OF THINGS, Sir William Bragg, $1.35 from Dover Publications, Inc., 180 Varick St., New York 14, N. Y. From same source, SOAP BUBBLES, C. V. Boys, 95¢; THE RESTLESS UNIVERSE, Max Born, $2. (From 15 yrs.)

By mail only, CHEMICAL ELEMENTS by Helen Miles Davis, revised by Glenn Seaborg, 55¢ postpaid from SCIENCE SERVICE, 1719 N St., N.W., Washington 6, D. C. (From 15 yrs.)

MAGAZINES, a most important source of current science news and ideas for personal investigation. Those most often mentioned by 11th National Science Fair-International finalists include SCIENCE NEWS LETTER, SCIENTIFIC AMERICAN, POPULAR SCIENCE, SCIENCE WORLD, NATURAL HISTORY, CHEMISTRY, POPULAR MECHANICS, SCIENCE DIGEST, SCIENCE, SKY AND TELESCOPE, NATIONAL GEOGRAPHIC, ELECTRONICS ILLUSTRATED, POPULAR ELECTRONICS, CHEMICAL AND ENGINEERING NEWS, NATURE and dozens of specialty journals published by scientific societies. (From 12 yrs.)

BLACK LIGHT MAGIC-GLO KIT, black light lamp, cord, stand; fluorescent paints, crayon, ink, powder, minerals, dye, braid, etc. Black Light Eastern Corp. $11.95 in stores. (12-15 yrs.)

BIO-PLASTIC KIT, to preserve specimens by embedding in clear plastic, 1 oz. Bio-Plastic, catalyst, mold, sea horse, mold-releasing compound, dropper, instructions, $1 postpaid. Larger kit, 8 oz. and practice specimens, $3.95 postpaid from Ward's Natural Science Establishment, Inc., Box 1712, Rochester 3, N. Y. (12-18 yrs.)

COLLECTION AND PRESERVATION OF INSECTS, booklet by U. S. Department of Agriculture senior entomologist, P. W. Oman, and chief scientific illustrator, A. D. Cushman; complete information. Misc. Pub. No. 601, 20¢, from U. S. Government Printing Office, Washington 25, D. C. (12-18 yrs.)

FOSSIL COLLECTIONS, Carboniferous #40,387, Cretaceous #40,386, Assorted #40,385; 10 specimens in each, about 1" in diameter, each sealed in plastic envelope. Include petrified wood, lampshell, dinosaur bone, brachiopods, horn coral, sea urchin, etc. $1.25 each set from Edmund Scientific Co., Barrington, N. J. (All ages.)

ILLUSTRATED GUIDE TO FOSSIL COLLECTING, by R. Casanova, director of Paleontological Research Laboratories, Statesville, N. C.; illus. by drawings, Smithsonian Institution photographs. $1.50 plus 20¢ handling charge from Naturegraph Co., 8339 W. Dry Creek Rd., Healdsburg, Calif. (From 12 yrs.)

SPACE SPIDER, string sculpture in three dimensions using fluorescent colored elastic string through perforated black panels. Cooper Bros. Co., $2.95 in stores. (All ages.)

BEGINNER'S MICROSCOPE, triple turret, 5x, 10x, 20x objectives, 6x and 10x

(Continued on p. 318)

Best Book Contest For 1960

$1800 Cash Awards plus 40% return. All types of manuscripts invited. For Contest rules and details of famous publishing plan, write for free Brochure SN.
Pageant Press, 101 Fifth Ave., N. Y. 3

You Get Things Done With Boardmaster Visual Control

☆ Gives Graphic Picture of Your Operations—Spotlighted by Color
☆ Facts at a glance — Saves Time, Saves Money, Prevents Errors
☆ Simple to operate — Type or Write on Cards, Snap in Grooves
☆ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
☆ Made of Metal. Compact and Attractive. Over 500,000 in Use

Complete price $49.50 including cards

FREE 24-PAGE BOOKLET NO. V-20 Without Obligation

Write for Your Copy Today
GRAPHIC SYSTEMS
Yanceyville, North Carolina

Study live insects and whole specimens!

with TESTA WIDE FIELD MICROSCOPE

Rugged, full-size American-made microscope features large working distance and 15x, 45x, and 75x magnification. Unusual versatility. Arm can be inclined in any direction of a 360° circle. Tube removable for field trips.

Kellner-type eyepiece. Triple divisible objective. Dual control rack & pinion focusing. Large reversible black and white stage. $54.85

No slides to prepare!

Write for details!

TESTA MANUFACTURING CO.
Dept. SN-11 • 10126 East Rush St., El Monte, Calif.

OPTICAL BARGAINS

Order by Stock No.—Send Check or M.O.—Satisfaction or Money Back!

OFFSPRING OF SCIENCE . . . REALLY BEAUTIFUL!
CIRCULAR DIFFRACTION—GRATING JEWELRY

Shimmering rainbows of gemlike color in jewelry of exquisite beauty — made with CIRCULAR DIFFRACTION — GRATING REPLICA. Just as a prism breaks up light into its full range of individual colors, so does the diffraction grating. Promises to become a rage in current fashion.

Stock #30,349-Q Earrings ..... $2.75 Pstpd.
Stock #30,350-Q Cuff Links ..... $2.75 Pstpd.
Stock #30,372-Q Pendant ..... $2.75 Pstpd.
Stock #30,390-Q Tie-Clasp ..... $2.75 Pstpd.

SCIENCE TREASURE CHESTS
For Boys—Girls—Adults!
Excellent "Science Fair" Material!

Science Treasure Chest—Extra-powerful magnets, polarising filters, compass, one-way-mirror film, prism, diffraction grating, and lots of other items for hundreds of thrilling experiments, plus a Ten-Lens Kit for making telescopes, microscopes, etc. Full instructions included.
Stock No. 70,342-Q ..... $5.00 Postpaid

Science Treasure Chest DeLuxe—Everything in Chest above plus exciting additional items for more advanced experiments including crystal-growing kit, electric motor, molecular models set, first-surface mirrors, and lots more.
Stock No. 70,343-Q ..... $1.00 Postpaid

Here's a Terrific Buy!
WAR SURPLUS! American-Made!
7 x 50 BINOCULARS

Big savings! Brand new! Crystal clear viewing — 7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7 mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost $195. Our war surplus price save you real money.
Stock No. 1533-Q .... only $55.00 pstpd. (tax incl.)

FLANNEL BOARD AND CUTOUTS

Teaching aid for all ages—from 5 up. Children enjoy doing simple arithmetic, mathematics problems, primary associations, alphabet and word drills, or use as means of self-expression. Sturdy Flannel Board is 12" x 18" on stand. More than 150 colored Felt Cutouts, letters, numbers, animals, shapes.
Stock No. 70,251-Q ..... $3.98 Postpaid

ANALOG COMPUTER KIT

Ideal introduction to the increasingly important electronic computer field. For bright students, or anyone interested in this new science. Demonstrates basic analog computing principles—can be used for multiplication, division, powers, roots, log operations, trig problems. Easily assembled with screwdriver and pliers. Operates on 2 flashlight batteries. Electric meter and 3 potentiometers are mounted on die-cut box. Answer is indicated on dial. Computer is 20" long, 9" wide, 2" deep.
Stock No. 70,341-Q ..... $14.95 Postpaid

Take Telephoto Shots Thru 7 x 50 MONOCULAR

This is fine quality, American made instrument—war surplus! Actually ½ of U.S. Gov't. 7 x 50 Binocular. Used for general observation both day and night and to take fascinating telephoto shots with your camera. Brand new. Due to Japanese competition we close these out at bargain price. Directions and mounting hints included.
Stock No. 50,003-Q ..... $15.00 Pstpd.

FREE CATALOG-Q
144 Pages! Over 1000 Bargains!

America's No. 1 source of supply for science experimenters, hobbyists. Complete line of Astronomical Telescope parts and assembled Telescopes. Also huge selection of lenses, prisms, war surplus optical instruments, parts and accessories. Telescopes, microscopes, satellite scopes, binoculars, infrared snipersccopes, items for making "Science Fair" projects, math learning and teaching aids. Request Catalog Q.

EASY PAYMENT PLAN AVAILABLE!
DETAILS WITH CATALOG!

EDMUND SCIENTIFIC CO.
BARRINGTON, NEW JERSEY

• Books of the Week •

For the editorial information of our readers, books received for review are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C.

ADVENTURES IN ALGEBRA: A Tutor Text—Norman A. Crowder and Grace C. Martin—*Doubleday*, 350 p., $3.95. New approach to self-teaching of the underlying ideas and concepts of algebra.

AQUATIC PLANTS OF THE PACIFIC NORTHWEST WITH VEGETATIVE KEYS—Albert N. Steward, La Rea J. Dennis and Helen M. Gilkey—*Ore. State College*, 184 p., paper, $2.50. Area studied includes Oregon, Washington, British Columbia and Alaska.

THE ARITHMETIC OF COMPUTERS: An Introduction to Binary and Octal Mathematics—Norman A. Crowder—*Doubleday*, rev. ed., 472 p., $3.95. Designed for self-instruction in number systems used in electronic computers, by method based on experience with automatic teaching methods.

THE BIOLOGICAL BASIS OF HUMAN FREEDOM—Theodosius Dobzhansky—*Columbia Univ. Press*, 139 p., paper, $1.25. Reprint of 1956 book which interprets some of the philosophical implications of modern biology in terms the layman can understand.

THE BIOLOGIST'S HANDBOOK OF PRONUNCIATIONS—Edmund C. Jaeger—*Thomas, C. C.*, 317 p., illus. by M. Van Dame and author, $6.75. Includes 9,000 commonly used generic names of plants and animals, Latin adjectives and adjectival compounds.

HOST INFLUENCE ON PARASITE PHYSIOLOGY—Leslie A. Stauber, Ed., introd. by Theodor von Brand—*Rutgers Univ. Press*, 96 p., illus., paper, $2. Proceedings of the Annual Conference on Protein Metabolism.

HOW TO STUDY AND TAKE EXAMS—Lincoln Pettit—*Rider, J. F.*, 81 p., illus., paper, $1. Written to help the student and job applicant to do his best and learn from his mistakes.

PAPER—Jerome S. Meyer—*World Pub. Co.*, 91 p., photographs, $3. History of papermaking from its beginnings in 105 A.D. to the present, and survey of the modern industry.

PERCHLORATES: Their Properties, Manufacture and Uses—Joseph C. Schumacher—*Reinhold*, 257 p., illus., $8.75. For the research worker.

PHYSICS—Physical Science Study Committee, preface by James R. Killian, Jr.—*Heath*, 656 p., illus., $5.48. Improved beginning physics text, presenting physics not as a mere body of facts but basically as a continuing process by which men seek to understand the nature of the physical world.

PHYSICS: Laboratory Guide—Physical Science Study Committee—*Heath*, 87 p., illus., paper, $1.36. Developed as an integral part of the PSSC course in physics with experiments so designed that students investigate physical phenomena rather than verify known conclusions.

REACTIONS BETWEEN COMPLEX NUCLEI: Proceedings of the Second Conference—Alexander Zucker, Frederick T. Howard and Edith C. Halbert, Eds.—*Wiley*, 319 p., illus., $7. Compendium of recent advances in the rapidly developing field of heavy-ion nuclear physics.

RECOMMENDATIONS FOR EDUCATION IN THE JUNIOR HIGH SCHOOL YEARS—James Bryant Conant—*Educ. Testing Service*, 46 p., paper, 50¢. Addressed to school boards, the recommendations are based on observations made of 237 schools during the last academic year.

SCIENCE AND MEDICINE OF EXERCISE AND SPORTS—Warren R. Johnson, Ed.—*Harper*, 740 p., illus., $12. Technical symposium for professional people and graduate students.

SELF-ORGANIZING SYSTEMS: Proceedings of an interdisciplinary conference—Marshall C. Yovits and Scott Cameron, Eds.—*Pergamon*, 322 p., illus., $8.50. Papers on Perception of the Environment, Effects of Environmental Feedback, Learning in Finite Automata, and Structure of Self-Organizing Systems.

SOURCE BOOK IN ASTRONOMY: 1900-1950—Harlow Shapley, Ed.—*Harvard Univ. Press*, 423 p., illus., $10. Contributions of interest to both the astronomer and the general reader, illustrating the vigorous march of astronomy during the first fifty years of the twentieth century. The selections include original reports by Einstein, Russell and Eddington.

STATIONS IN SPACE—Donald Cox—*Holt, Rinehart and Winston*, 56 p., illus. with drawings by W. A. Kocher, $2.95. Gives young readers facts and plans about space exploration.

THE STORY OF HORSES—Dorothy E. Shuttlesworth—*Garden City Bks.*, 57 p., illus. with drawings by M. Kalmenoff, $2.95. For boys and girls, profusely illustrated.

STUDENT MANUAL — Roy Dubisch — *Van Nostrand*, 63 p., illus., paper, $1. To accompany INTRODUCTION TO MODERN ALGEBRA by John L. Kelley used in the television course on Modern Algebra on "Continental Classroom."

FREE CATALOGUES OF SCIENCE BOOKS

State your interest! Mathematics, physics, history of science, general science, biology, social sciences, earth sciences, chemistry, languages, philosophy, engineering. Dover publishes over 100 books per year; quality production standards, priced for your budget. Dept. SNL. DOVER, 180 Varick St., N. Y. 14, N. Y.

USED AND APPROVED BY LEADING UNIVERSITIES

Model RV-6

6-INCH DYNASCOPE Reflecting Telescope

includes these features:

- Electric Drive
- Rotating Tube
- Setting Circles

Only **$194.95** F.O.B. Hartford Shipping Wt. 50 lbs. Express charges collect

Easy Terms Available!

Completely Portable! Entire telescope dismantles in minutes for easy carrying.

Finest American-made 6-inch reflector in its price range! Save $100 or more, yet get all these fine features. f/8 6-inch mirror accurate to ¼ wave • 3 matched eyepieces (75X, 150X, 343X) • 6x30 Achromatic finderscope • Heavy-duty mount with setting circles • Rack & Pinion eyepiece holder • Sturdy lightweight tripod.

CRITERION MANUFACTURING COMPANY

Dept. NL-73, 331 Church St., Hartford 1, Conn.

—FREE FACTS! MAIL COUPON!—

Criterion Manufacturing Company
Dept. NL-73, 331 Church St., Hartford 1, Conn.
☐ Under your unconditional guarantee, please ship me promptly the RV-6 DYNASCOPE. My payment of $194.95 is enclosed.
☐ Please send FREE LITERATURE on the RV-6 Dynascope and your other DYNASCOPES priced as low as $49.95.

Name .....
Address .....
City ..... State .....

THE BEGINNER'S BOOK OF

Oil Painting

BY ADRIAN HILL

Three things this book will *not* do:
It will not turn anyone into a Michelangelo in 10 easy lessons. Nor in 99. Not even into a very primitive Gauguin.

Some things it *will* do:
It will provide inspiration and instruction on a self-teaching basis, to get you launched on the exciting and rewarding pastime of painting in oils. It will do so in a relaxed yet effective way. You will not be harassed with rigid rules, nor expected to follow a prescribed "style." Rather you will be encouraged to "invite your soul," to experiment, to test your abilities, to follow your natural impulses and see where they lead . . . Ultimately a technique peculiarly your own is likely to evolve.

Famed artist-teacher Adrian Hill will provide the ground rules. He will make you acquainted with the "tools"—palette, brushes, paints, etc.—and tell you how to use them. You will be shown their potentials—also their limitations. You will see "wrong/right" examples that illustrate key points. You will be made aware of the pitfalls that abound. The possible range and arrangement of subject matter will be explored, as well as light and shade effects. Always you will be urged to "learn-by-doing."

You can readily find out if this is the book for you. Order it and use it for 10 days. If not delighted with results, return it for full refund of purchase price. Fair enough?

"An excellent book for the art library and invaluable to the amateur at home."—*Arts & Crafts Education.*

11 full-color and 95 black-and-white illustrations

ORDER NOW!

$2.95 Postfree • 10-Day Money-Back Guarantee

EMERSON BOOKS, Inc., Dept. 129-M
251 W. 19th Street, New York 11

Do You Know

A grand piano's most powerful *sounds* run from 70 to 95 decibels—not likely to damage the ear.

A total of 160 Russian vessels with total crews of 25,000 were reported to be *fishing* off the Newfoundland banks during the summer of 1960.

100% American Made PROFESSIONAL STETHOSCOPE $3.00

Not a toy. Genuine M.D. Ford model. Thousands sold now in use by doctors, nurses, veterinarians, farmers, auto mechanics, TV-Radio repairers, stock breeders, life guards, etc. Every home, office, shop, factory should have one or more. Transmits low-pitched sounds, machinery noises, heart murmurs. With plastic bell and ear-tips and chromed metal parts, pure rubber tubes. $3.00 p.p.

HARRY ROSS *Scientific & Lab Apparatus* 61-L Reade St., N.Y. 7, N.Y.

MAKE MONEY WRITING
. . short paragraphs!

You don't have to be a trained author to make money writing. Hundreds now making money every day on short paragraphs. I tell you what to write, where and how to sell; and supply big list of editors who buy from beginners. Lots of small checks in a hurry bring cash that adds up quickly. No tedious study. Write to sell, right away. Send for free facts. BENSON BARRETT. Dept. 163-Y, 7464 N. Clark St., Chicago 26, Ill.

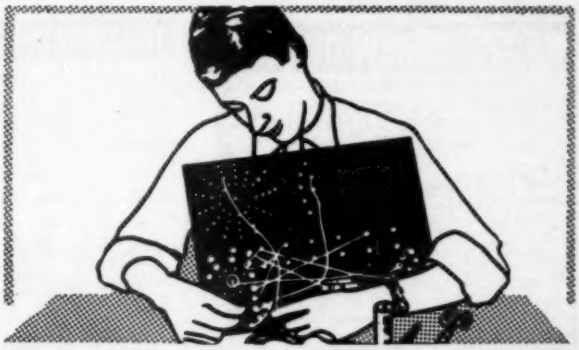
Make over 200 Small Computing and Reasoning Machines with . . .

BRAINIAC®

ELECTRIC BRAIN CONSTRUCTION KIT, 1960 MODEL

EQUALS THE ORIGINAL 1955 electric brain construction kit **PLUS** many improvements and additions: over 600 parts—including 116 improved patented wipers so that all switches work well. The BRAINIAC K18 Kit gives full specifications for 201 computing, reasoning, arithmetical, logical, puzzle-solving and game-playing machines . . . 155 BRAINIACS (1957-58-59), etc., 13 TYNIACS (1956), and 33 original GENIACS® (1955).

WITH OUR BRAINIAC KIT K18, you can build over 200 small electric brain machines and toys which "think," compute, reason and display intelligent behavior. Each one works on a single flashlight battery . . . is FUN to make, FUN to use and play with, and TEACHES you something new about electrical computing and reasoning circuits. All connections with nuts and bolts—no soldering required. The Brainiac K18 kit is the result of 12 years' design and development work with miniature mechanical brains including: the original 1955 kit, Tyniacs (1956), Relay Moe (automatic relay machine playing tit-tat-toe—pictured in Life Magazine, March 19, 1956), Simon (miniature automatic digital computer with 129 relays—see "Simple Simon" by E. C. Berkeley in scientific American, November 1, 1950), Squee (electronic robot squirrel—see "Light Sensitive Electronic Beast" by E. C. Berkeley in Radio Electronics, December 1951), etc.



WHAT CAN YOU MAKE WITH BRAINIAC KIT K18? Over 200 machines including—LOGIC MACHINES: Syllogism Prover, Intelligence Test, Boolean Algebra Circuits, Douglas MacDonald's Will Analyzer, A Simple Kalin-Burkhart Logical Truth Calculator, Diagnosing Motor Car Trouble, etc. GAME-PLAYING MACHINES: Tit-Tat-Toe, Nim, Wheeled Bandit, Black Match, Sundorra 21, etc. COMPUTERS: To add, subtract, multiply or divide using decimal or binary numbers, Forty-Year Calendar, Prime Number Indicator, Money-Changing Machine, etc. CRYPTOGRAPHIC MACHINES: Coders, Decoders, Lock with 15,000,000 Combinations, etc. PUZZLE-SOLVING MACHINES: The Missionaries and the Cannibals, Age-Guessing Machine, Submarine Rescue Chamber, Daisy Petal Machine, Fox-Hen-Corn & Hired Man, Uranium Space Ship and the Space Pirates, The Three Monkeys Who Spurned Evil, General Alarm at the Fortress of Dreadeerie, etc. QUIZ MACHINE: How to Tell an Aardvark from an Armadillo, The Waxing and the Waning Moon, Polar Air Routes, history, geography, trigonometry, grammar, statistics, calculus, etc.

PROGRAMMING *YOUR OWN* PROBLEMS FOR THE BRAINIAC

The Brainiac is the smallest and lowest-cost semi-automatic, general-purpose digital computer existing. Many problems in ALL fields of knowledge and business can be programmed for the Brainiac—to the extent that a number of versatile multiple switches can express the problem. We shall be glad to program YOUR OWN problems. Write us—no charge for simple problems, modest charge for complicated ones.

WHAT COMES WITH YOUR BRAINIAC K18 KIT—

Complete Plans, Instructions, Explanations & Hardware:

- Every part needed to build Brainiacs, Tyniacs—over 600 pieces including control panel, multiple switch discs, jumpers, improved wipers (Pat. No. 2,848,568), bulbs, sockets, washers, wire, battery and special tools.
- Complete descriptions of 201 experiments and machines in book of 256 pp.
- Over 170 circuit diagrams including 13 exact wiring templates.
- Manual "Brainiacs—Small Electric Brain Machines—Introduction and Explanation" by Edmund C. Berkeley, 1959.
- "Introduction to Boolean Algebra for Circuits and Switching" by Edmund C. Berkeley.
- "How to Go from Brainiacs to Automatic Computers" by Edmund C. Berkeley.
- List of references to computer literature including "Minds and Machines" by W. Sluckin, published by Penguin Books (Baltimore), 1954, 233 pages, and other references.

only $18.95 ... *MORE VALUE & MORE FEATURES*

WHO IS EDMUND C. BERKELEY? Author of *Giant Brains or Machines That Think*, Wiley, 1949, 270 pp. (15,000 copies sold); Author of *Computers: Their Operation and Applications*, Reinhold, 1956, 366 pp.; Author of *Symbolic Logic and Intelligent Machines*, Reinhold, 1959, 203 pp.; Editor & Publisher of the magazine, *Computers and Automation*; maker and developer of small robots; Fellow of the Society of Actuaries; Secretary (1947-53) of the Association for Computing Machinery; Designer of all the Tyniacs and Brainiacs.

BRAINIAC KIT (1960 MODEL) K18 . . . the kit with limitless possibilities—backed by an organization of 12 years standing in the computer field—$18.95. (For shipment west of Mississippi, add 80¢; outside U.S., add $1.80.)

7-Day Full Refund Guarantee If Not Satisfactory

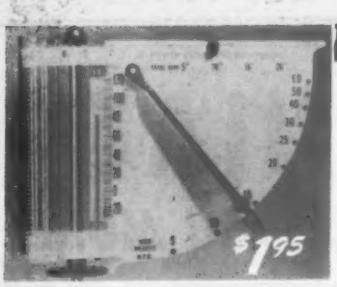
MAIL THIS COUPON OR A COPY OF IT

BERKELEY ENTERPRISES, Inc.

815 Washington St., R227, Newtonville 60, Mass.

Please send me Brainiac Kit K18. (Returnable in 7 days for full refund if not satisfactory—if in good condition.) I enclose $_____ in full payment.

My name and address are attached



YOUR OWN WEATHER BUREAU

New fascinating WEATHERCHEK tells you: 1. **Rainfall** in glass gage. 2. **Total Rainfall** by movable pointer. 3. **Wind Direction** on rotating vane. 4. **Wind Velocities** by weighted vane on circular scale. 5. **All-weather Thermometer**

ACCURATE — INSTRUCTIVE — DURABLE

Plastic, with contrasting large embossed scales. Approximately 7" x 7". Easily attached to garage, porch, house, pole, boat, etc.

Ideal for lawns, gardens, schools — A welcome Christmas gift . . . Easily remailed in our shipping box. Guaranteed. Postpaid.

THE JONATHAN CO., P.O. Box 5095A, Mt. Carmel, Conn.

ARCO SCREW-DRILL

FOR EVERY WOODSCREW

DRILLS HOLE, COUNTERSINKS, COUNTERBORES IN 1 OPERATION

Adjusts for ANY Screw Length!

For quick, accurate screw driving. Prevents wood splitting, stripped threads. Insures 100% holding power of each screw thread. Set of 4 drills for all #6-8-10-12 woodscrews—flat, round, oval heads. Use with hand or electric drills, drill press on woods, plastics, aluminum. 4 Piece Set. . . . **$3.69**

Order today on our 20-day Money Back Guarantee. Send check, M. O.—we pay post. (No COD's).

ARCO ARROW METAL PRODUCTS CO.
Dept. 11-12SN, 421 W. 203 St., NYC 34

TELLS HOW TO SELL YOUR INVENTION

If you have an invention that you believe has merit, write us at once for copy of copyrighted booklet "How to Go About Selling Your Invention." We work with manufacturers, and booklet reveals present markets, qualities of a saleable invention, current royalty rates being paid by manufacturers. Booklet is FREE, is offered to encourage new ideas we might submit to manufacturers. Just send name (no drawings please) to

Kessler Sales Corp., Dept. D-4111, Fremont, Ohio

RADIOMETER

American made. Balanced four arm vane, in a 3" diameter evacuated glass globe, turns upon exposure to light, any light, even a lighted match. Highly decorative, interesting, educational, instructive. A conversation piece. We guarantee yours to operate. $3.00 p.p. 2 for $5.00 p.p.

HARRY ROSS *Scientific & Lab Apparatus* 61-L Reade St., N.Y. 7, N.Y.

Looking for a PUBLISHER?

Your book can be published, promoted, distributed by successful, reliable company noted for prompt, personal service. All subjects. Free Editorial Report. Inquiries also invited from businesses, churches, etc. Send for Free Booklet.

Vantage Press, Dept. T-8, 120 W. 31, New York 1

"Portable Laboratories" for the classroom

How to dramatize science in the primary grades

Here is an ingenious new visual method for bringing basic science concepts to life for children as young as eight years. MOTOGRAPH SCIENCE CHARTS enable teachers and even youngsters to demonstrate scientific principles in action. Colorful, sturdy, 13 x 17 inches each, easily visible from all parts of a classroom, employing removable parts and detachable adhesive labels. Designed for us by Harry Milgrom, supervisor of elementary science for New York City Board of Education, MOTOGRAPH SCIENCE CHARTS deal with: The Eye; The Seasons; How the Day Grows; Thermometer; Electric Bell. Five charts, fully assembled, $1.95 each. Quantity discounts for schools. For complete catalog of PORTABLE LABORATORY teaching aids, write Science Materials Center, 59 Fourth Avenue, New York 3, N.Y. Dept. M-144.

SCIENCE MATERIALS CENTER
a division of The Library of Science

MICRO-ADS

Equipment, supplies and services of special interest to scientists, science teachers and students, science-minded laymen and hobbyists. 25¢ per word, payable in advance. Closing date 3 weeks prior to publication (Saturday).

SNL, 1719 N St., N.W., Washington 6, D. C.

"ADVENTURES IN SCIENCE AT THE SMITHsonian." A science book for young people, profusely illustrated with full-page color photos. 25¢ per copy, or 6 for $1.00. Order direct from: Colortone Press, 2400 17th Street, N.W., Washington 9, D. C.

GOVERNMENT SURPLUS RADIOS, RECEIVERS, transmitters, gadgets, parabolic reflectors, infra-red snooperscopes, aircraft, camera lenses. Amazing catalog 10¢. John Meshna, Malden 48, Mass.

NATIONAL GEOGRAPHIC MAGAZINES 1888-1960, any issue. Periodical Service, Box 465-SN., Wilmington, Delaware.

NEW LIQUID CASTING PLASTIC, CLEAR COLors. Embed real flowers, minerals, biological specimens, delicate instruments, electronic parts. Also cold setting resin and fiberglass for laminating, casting, molding coating. Manual 25¢. Castolite Company, Dept. M-30, Woodstock, Illinois.

PHOTOMULTIPLIER TUBES, SCINTILLATOR crystals, high voltage power supplies, scalers, automatic recorders, X-Y plotter, oscillographs with galvanometers, transformers, other electronics. Never before offered. Los Alamos Sales Co., Box 795, Los Alamos, New Mexico.

ROCKET-LOX, SOLID, H202, RECOVERY, Static Test Launchers, Design, Thrust, Flares, over 100 drawings. 32 Pages. $1.00. Humphreys, P.O. Box 90391, Los Angeles 45, Calif.

THE STRUCTURE OF THE ATOM—23 PAGES with many diagrams. A completely new system of atomic structure, comprising structural center, but no nucleus. Price 25 cents ppd. C. F. Kraft, 218 Columbia Road, Annandale, Virginia.

Science for Christmas

(Continued from p. 315)

eyepieces. In wooden box, $7.25, from Science Materials Center, 59 Fourth Ave., New York 3, N. Y. (6-14 yrs.)

MICROSCOPE SLIDE BOOKS, each containing six slides. Subjects such as animals, plants, fibers, crystals, etc. Polk's Model Craft Hobbies, Inc. About 69¢ per book in stores. (6-14 yrs.)

EDU-KITS, small basic kits with parts, instructions. Motor Kit, 35¢; Crane and Gear, 50¢; Horn Kit, 35¢; Bell Kit, 35¢; Aristo-Craft. In stores. (6-10 yrs.)

TURTLE GARDEN, seeds, soil, live turtle, plant food, dinosaur models, plastic tray. Walter L. Herne Co. $3 in stores. (Pre-school-12 yrs.)

FOSSIL SET, nine small fossils (coral, dinosaur bone, trilobite, snail, etc.) set in 3" x 5" foam plastic box, beginner's text, time scale. $2.75 postpaid from Ward's Natural Science Estab., Inc., Box 1712, Rochester, 3, N. Y. (8-18 yrs.)

BUTTERFLY MOUNTING SET, six tropical butterflies, 100 insect pins, spreading board, pinning block, labels, cedarwood box, display box, illus. instruction booklet. $6.95 postpaid from Ward's Natural Science Estab., Inc., Box 1712, Rochester 3, N. Y. (10-18 yrs.)

BASIC KIT OF PLANETS, SPACE AND STARS, full-length illus. book, sky maps, small telescope with tripod, compass, constellation finder, record chart. Harvey House. $3.95 in stores. (6-12 yrs.)

OPTICAL SET, prism, 32-p. booklet of instruction and information, beginner's lens kit (10 lenses), Star and Satellite Path Finder, diffraction grating in 35 mm ready-mount, two polarizing filters, five lenses double-convex 14 x 48 mm, #50,204, $3 from Edmund Scientific Co., Barrington, N. J. (14 yrs. on.)

TWENTY IN ONE ELECTRONIC EXPERIMENTERS KIT, breadboard assembly, all parts mounted on perforated board. With exception of batteries, all parts for 20 different circuits supplied; manual of background information; large, very clear assembly diagrams. Lafayette Radio Electronics Corp. About $18.95 in electronics retail stores. (15 yrs. on.)

MAGNETISM SET, stocking-stuffer for 35¢. Small magnet, soft iron keeper, iron filings, magnetic compass, strip of pure nickel. From Harry Ross, 63 Reade St., New York 7, N. Y. (8-12 yrs.)

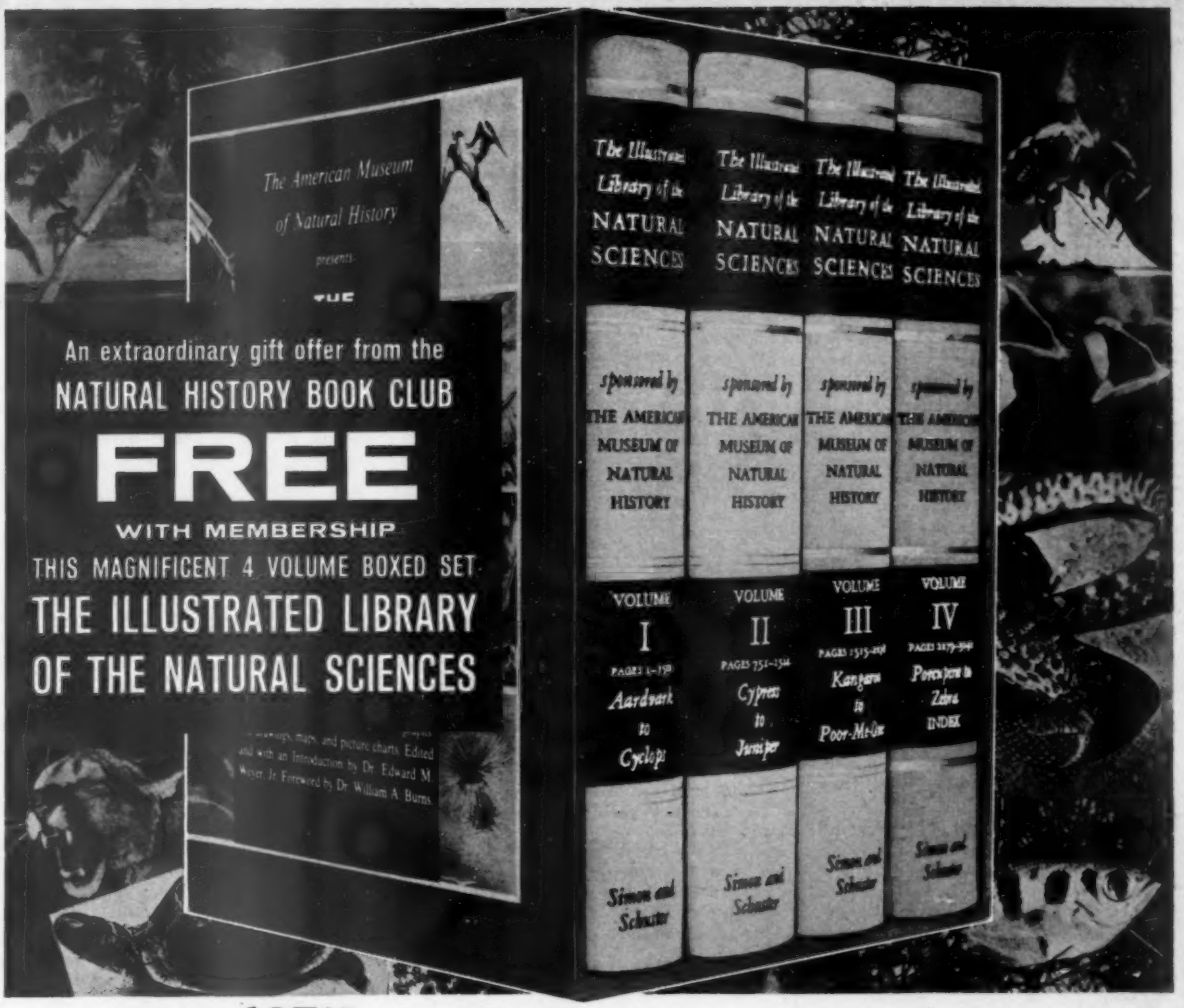
• Science News Letter, 78:314 November 12, 1960

Questions

MEDICINE—What forms of fungus did scientists use in developing vaccine against valley fever? p. 309.

ZOOLOGY—How does the hermit crab "fit" itself into a new home? p. 313.

***Photographs:* cover, United States Steel Corporation; p. 307, (left) University of Michigan, (right) Fabian Bachrach; p. 309, Westinghouse Electric Corporation; p. 310, Republic Aviation Corporation; p. 311, U. S. Air Force; p. 314, Fremont Davis; p. 320, Eastman Chemical Products, Inc.**



Published at $25.00

under the sponsorship of
The American Museum of Natural History

- **OVER ONE MILLION WORDS**
- **MORE THAN 3,000 PAGES**
- **OVER 3,000 ILLUSTRATIONS**
- **165 DISTINGUISHED CONTRIBUTORS**

A breathtaking panorama of knowledge in every area of natural science—from anthropology to zoology, from aardvark to zebra. The famous contributors include Marston Bates, William Beebe, Arthur Clarke, J. Frank Dobie, Willy Ley, Donald Culross Peattie, T. C. Schneirla, Edwin Way Teale, and many others.

For the most readable and informative books in the natural sciences, you are invited to join the Natural History Book Club—and to accept as a welcoming gift the magnificent four-volume set illustrated above. Membership in the Natural History Book Club provides a fascinating and rewarding way to keep abreast of science's continuing discoveries about the origin of the Earth and its composition; the incredible variety of vegetation, insects, fishes, reptiles and mammals found on it; and the evolution of man himself from primitive savagery to the complex civilizations of today. From anthropology to meteorology, from oceanography to zoology, the Natural History Book Club offers you the latest and most important works by leading authorities in the major areas of the natural sciences—always at substantial savings.

To join now and receive *The Illustrated Library of the Natural Sciences* free, simply choose the volume you want as your first Selection from those described below. As a member you need purchase only three additional Selections at reduced Member's Prices during the next 12 months. You will also receive a valuable free bonus book with every fifth purchase.

CHOOSE YOUR FIRST SELECTION FROM AMONG THESE SIX IMPORTANT BOOKS

90° SOUTH, *by Paul Siple.* The dramatic story of the building of the American base at the South Pole—and of the first men to winter at the bottom of the world—told by the leader of the IGY expedition. 34 photographs, 14 in full color.
LIST PRICE $5.75, *Member's Price* **$4.95**

THIS SCULPTURED EARTH, *by John A. Shimer.* A brilliantly written natural history of the earth's surface, from the Pre-Cambrian Age to the present. "A model of how to communicate science." *The New York Times.*
LIST PRICE $7.50, *Member's Price* **$5.50**

THE LIVING FOREST, *by Jack McCormick.* "A remarkably attractive book packed with a remarkable amount of material on trees and forests." *Los Angeles Herald & Express.* 137 illustrations.
LIST PRICE $3.95, *Member's Price* **$3.50**

WILDLIFE IN AMERICA, *by Peter Matthiessen.* Nearly 200 spectacular photographs and drawings help describe "what has happened, what is happening and what is likely to happen to the wildlife of North America." *Edwin Way Teale.*
LIST PRICE $10.00, *Member's Price* **$5.95**

ANIMAL BEHAVIOR, *by John Paul Scott.* "Head and shoulders above all other books in the field." *Natural History.* "Clear, simply written and unfailingly interesting." *Scientific American.*
LIST PRICE $5.00, *Member's Price* **$4.25**

A TREASURY OF SCIENCE, *edited by Harlow Shapley.* Revised, enlarged 4th Edition—789 pages—of the famous panoramic presentation of science. "A distinguished anthology, painstakingly presented." *Science.*
LIST PRICE $6.95, *Member's Price* **$5.50**

THE NATURAL HISTORY BOOK CLUB **H-49**
63 Fourth Avenue, New York 3, N. Y.

Please enroll me as a member and send, as a Membership Gift, THE ILLUSTRATED LIBRARY OF THE NATURAL SCIENCES, along with my first Selection at the reduced Member's Price. My only obligation is to take three more Selections during the next 12 months; I will receive a free Bonus Book with every fifth purchase.

First Selection_____

Additional Selection Desired_____

Name_____

Address_____

City_____ Zone____ State_____

New Machines and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 1065. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

CHRISTMAS ORNAMENT CHEST, a divided cardboard chest, protects delicate decorations for use the next season. The chest has sections for 96 large ornaments or 300 smaller ones, eight sets of lights, tinsel, and under-tree items.

• Science News Letter, 78:320 November 12, 1960

GALLOPING HOBBY HORSE goes forward and backward as it bucks up and down. The horse is made of soft, but tough, vinyl plastic with a molded-in Western saddle. The frame is sturdy metal tubing, with a spring adjustable to child's weight.

• Science News Letter, 78:320 November 12, 1960

MAGNETS AND COILS KIT, for youngsters from the fifth to ninth grades, includes three Alnico magnets and other required materials to enable students to perform their own experiments in magnetism. Instructions set forth ten simple experiments that can be performed with supplies in the kit.

• Science News Letter, 78:320 November 12, 1960

CHRISTMAS TREE AND STAND for table-top use are joined in a permanent, leakproof connection by means of molded sleeves of tough plastic material. The metal stand, shown in the photograph, contains "synthetic sap," liquid nutrient in direct contact with the bark of the stem which

transports the sap to the tree. The feeding delays needle drop and extends life and freshness of the tree.

• Science News Letter, 78:320 November 12, 1960

RUST-PREVENTIVE GUN CASE gives firearms protection for a year or more. The disposable case is made of chemically impregnated kraft paper laminated to embossed aluminum. No oil or grease is needed. Cases are available for rifle, shotgun or pistol.

• Science News Letter, 78:320 November 12, 1960

PLASTIC MIXING BOWL of high density polyethylene is boilproof, withstands rigorous usage, including washing in the high temperature of a dishwasher as well as the below-freezing temperatures of a home freezer. It comes with a seal-tight snap-off-and-on cover and is specially designed for electric mixers.

• Science News Letter, 78:320 November 12, 1960

ONE-WHEELED CYCLE, a child's version of the old-time unicycle, provides new pedaling sport and helps develop coordination and confidence in the growing youngster. The cycle can be adjusted for different leg lengths and has training poles, which make learning easy. It holds up to 100 pounds.

• Science News Letter, 78:320 November 12, 1960

NYLON-HANDLED CUTLERY has blades of high-quality steel and can be washed in dishwasher. The long, streamlined handles of nylon resin provide a comfortable gripping area when the knives are in use. For the table, a set of steak knives and a carving set are offered. For the kitchen, seven knives are available, as well as a matching fork and off-set spatula.

• Science News Letter, 78:320 November 12, 1960

Nature Ramblings

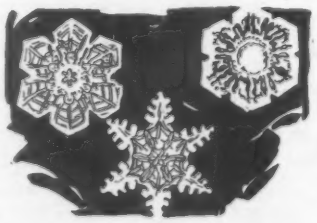
WHATEVER THE USES of snow, whether for skiing, for packing into snowballs, for incapacitating automobiles or for muffling sound, most persons agree that an untouched snow blanket is one of the most peaceful sights of winter.

In any one snowfall, several types of snow crystals may be found. For a few minutes, one type may be dominant, then another starts to mix in and finally takes over, and so on to a third.

There are two basic types of snow crystals: the flat-faced stars and the hexagonal prisms, which become columns when elongated. Variations and combinations of these types may form bullets, needles, cufflinks, thick or thin stars and, in rare cases, pyramids.

Most snow crystals are six-sided because they are made up of ice crystals, which are themselves hexagonal. Occasionally a three- or four-pronged star shape is found, but the angles between the prongs are always the same as they would be for a six-pointed figure. In many cases, the extra branches

Snowflakes



are actually present, but so small and rudimentary that they are barely visible under a high-power microscope.

But one type, the three-sided or trigonal plate form, is believed to be a true triangle-based shape.

Whether a snowflake becomes an intricate and lacy star, a column or a pyramid depends upon the altitude, temperature and moisture conditions of the air through which the flake passes.

When a cold snowflake, just beginning to form, falls from a high altitude through a layer of warm, moisture-saturated air, it usually grows into a star shape and can become relatively large because it glides and has more time to collect additional particles.

When the temperature drops low enough that there is a ring around the moon, most of the water vapor has turned to ice crystals and well developed columnar shapes are more easily formed.

In the blistering cold of the arctic and antarctic regions, where cirrus clouds sometimes sit almost on the ground, columns with hollow ends are frequently seen.

Somewhere in between the extremes, bullet-shaped crystals, made up of a column with a pyramid on one end and a flat plate on the other, and cufflinks, made of a column with a flat plate on each end, are formed.

The rapidly changing conditions during a snowfall produce the mixture of plain and fancy shapes that pile up into winter snow.

GLORIA BALL

• Science News Letter, 78:320 November 12, 1960